

# **APPENDIX B**

## **TABLES OF FACTORS FOR PRESENT WORTH CALCULATIONS: CONVENTIONAL APPROACH**

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B-1. Tables B-1 and B-2 provide annual cash-flow-series equivalence factors—i.e., factors which make it possible to compute the one-time-cost equivalent of an annual cash-flow series directly—for a series of constant or uniformly escalating, annually recurring cash flows. These factors are presented as ratios of (1) the magnitude of the equivalent one-time cost for the series (i.e., the PW of the series), at the time of the first cash flow in the series, and (2) the magnitude of the first cash flow in the series. Table B-1 is based on a 7 percent discount rate, and table B-2 is based on a 10 percent discount rate. The tables cover differential escalation rates from -5 percent through +10 percent, including 0 percent, in 1 percent increments. They provide equivalence factors for series of 1, 2, . . . 30, 40, 45, and 50 annual cash flows (payments, income, savings, etc.).

Table B-1 Annual cash-flow-series equivalence factors - annual discount rate = 7.00%

NO. IN SERIES	ANNUAL ESCALATION RATE															NO. IN SERIES	
	-5%	-4%	-3%	-2%	-1%	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%		10%
1 *	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
2 *	1.888	1.897	1.907	1.916	1.925	1.935	1.944	1.953	1.963	1.972	1.981	1.991	2.000	2.009	2.019	2.028	2
3 *	2.676	2.702	2.728	2.755	2.781	2.808	2.835	2.862	2.889	2.917	2.944	2.972	3.000	3.028	3.056	3.085	3
4 *	3.376	3.424	3.473	3.523	3.573	3.624	3.676	3.728	3.781	3.835	3.889	3.944	4.000	4.056	4.114	4.171	4
5 *	3.997	4.072	4.149	4.227	4.306	4.387	4.470	4.554	4.640	4.727	4.817	4.907	5.000	5.094	5.190	5.288	5
6 *	4.549	4.654	4.761	4.871	4.984	5.100	5.219	5.341	5.466	5.595	5.727	5.862	6.000	6.142	6.287	6.437	6
7 *	5.039	5.175	5.316	5.461	5.612	5.767	5.927	6.092	6.262	6.438	6.619	6.807	7.000	7.199	7.405	7.617	7
8 *	5.474	5.643	5.819	6.002	6.192	6.389	6.594	6.807	7.028	7.257	7.496	7.743	8.000	8.267	8.543	8.831	8
9 *	5.860	6.063	6.275	6.497	6.729	6.971	7.224	7.489	7.765	8.054	8.356	8.671	9.000	9.344	9.703	10.078	9
10 *	6.203	6.440	6.689	6.951	7.226	7.515	7.819	8.139	8.475	8.828	9.199	9.590	10.000	10.431	10.884	11.361	10
11 *	6.507	6.778	7.064	7.366	7.686	8.024	8.381	8.759	9.158	9.581	10.028	10.500	11.000	11.529	12.088	12.679	11
12 *	6.777	7.081	7.404	7.747	8.111	8.499	8.911	9.349	9.816	10.312	10.840	11.402	12.000	12.636	13.314	14.035	12
13 *	7.017	7.353	7.712	8.095	8.505	8.943	9.411	9.912	10.449	11.023	11.637	12.295	13.000	13.755	14.563	15.428	13
14 *	7.230	7.597	7.991	8.414	8.869	9.358	9.883	10.449	11.058	11.714	12.420	13.181	14.000	14.883	15.835	16.861	14
15 *	7.419	7.816	8.244	8.706	9.206	9.745	10.329	10.961	11.645	12.385	13.188	14.057	15.000	16.022	17.131	18.334	15
16 *	7.587	8.013	8.474	8.974	9.517	10.108	10.750	11.449	12.210	13.038	13.941	14.926	16.000	17.172	18.451	19.848	16
17 *	7.736	8.189	8.682	9.219	9.806	10.447	11.147	11.914	12.753	13.673	14.681	15.786	17.000	18.332	19.796	21.404	17
18 *	7.869	8.347	8.870	9.444	10.073	10.763	11.522	12.357	13.276	14.289	15.406	16.639	18.000	19.504	21.166	23.004	18
19 *	7.986	8.489	9.041	9.649	10.320	11.059	11.876	12.780	13.780	14.889	16.118	17.483	19.000	20.686	22.562	24.649	19
20 *	8.091	8.616	9.196	9.838	10.548	11.336	12.210	13.182	14.265	15.471	16.817	18.320	20.000	21.879	23.983	26.340	20
21 *	8.183	8.730	9.337	10.010	10.759	11.594	12.525	13.566	14.732	16.037	17.503	19.149	21.000	23.084	25.432	28.079	21
22 *	8.266	8.833	9.464	10.168	10.955	11.836	12.823	13.933	15.181	16.588	18.176	19.970	22.000	24.300	26.907	29.866	22
23 *	8.339	8.925	9.580	10.313	11.136	12.061	13.104	14.281	15.613	17.123	18.836	20.783	23.000	25.527	28.410	31.703	23
24 *	8.403	9.007	9.684	10.446	11.303	12.272	13.369	14.614	16.030	17.643	19.484	21.589	24.000	26.765	29.941	33.592	24
25 *	8.461	9.081	9.779	10.567	11.458	12.469	13.620	14.931	16.430	18.148	20.120	22.387	25.000	28.015	31.501	35.534	25
26 *	8.512	9.148	9.865	10.678	11.602	12.654	13.856	15.233	16.816	18.639	20.744	23.178	26.000	29.277	33.089	37.530	26
27 *	8.557	9.207	9.943	10.780	11.734	12.826	14.079	15.522	17.188	19.117	21.356	23.961	27.000	30.551	34.708	39.583	27
28 *	8.598	9.261	10.014	10.873	11.857	12.987	14.289	15.796	17.545	19.581	21.957	24.737	28.000	31.836	36.357	41.693	28
29 *	8.633	9.309	10.078	10.959	11.970	13.137	14.488	16.058	17.889	20.032	22.546	25.506	29.000	33.134	38.036	43.861	29
30 *	8.665	9.352	10.136	11.037	12.075	13.278	14.676	16.308	18.220	20.470	23.125	26.268	30.000	34.444	39.747	46.091	30
35 *	8.778	9.509	10.355	11.340	12.494	13.854	15.467	17.391	19.700	22.484	25.859	29.971	35.000	41.178	48.794	58.214	35
40 *	8.840	9.600	10.489	11.535	12.777	14.265	16.060	18.244	20.923	24.231	28.348	33.503	40.000	48.233	58.718	72.133	40
45 *	8.874	9.653	10.571	11.661	12.970	14.558	16.505	18.916	21.934	25.747	30.612	36.874	45.000	55.623	69.605	88.117	45
50 *	8.893	9.684	10.621	11.742	13.100	14.767	16.838	19.445	22.769	27.062	32.673	40.090	50.000	63.366	81.549	106.471	50

Equation:

$$\text{Annual Equivalence Factor} = \frac{1 - v^n}{1 - v}, \text{ where } v = \frac{1 + e}{1 + d}$$

e = annual escalation rate  
d = discount rate  
n = number of years

Cash Flow Diagram:

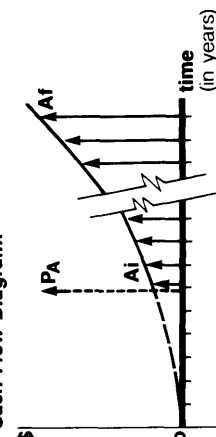


Table B-2 Annual cash-flow-series equivalence factors - annual discount rate = 10.00%

NO. IN SERIES	ANNUAL ESCALATION RATE															NO. IN SERIES	
	-5%	-4%	-3%	-2%	-1%	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%		10%
1 *	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1
2 *	1.864	1.873	1.882	1.891	1.900	1.909	1.918	1.927	1.936	1.945	1.955	1.964	1.973	1.982	1.991	2.000	2
3 *	2.610	2.634	2.659	2.685	2.710	2.736	2.761	2.787	2.813	2.839	2.866	2.892	2.919	2.946	2.973	3.000	3
4 *	3.254	3.299	3.345	3.392	3.439	3.487	3.535	3.584	3.634	3.684	3.735	3.787	3.839	3.892	3.946	4.000	4
5 *	3.810	3.879	3.950	4.022	4.095	4.170	4.246	4.324	4.403	4.483	4.566	4.649	4.735	4.821	4.910	5.000	5
6 *	4.290	4.385	4.483	4.583	4.686	4.791	4.899	5.009	5.123	5.239	5.358	5.480	5.605	5.734	5.865	6.000	6
7 *	4.705	4.827	4.953	5.083	5.217	5.355	5.498	5.645	5.797	5.953	6.115	6.281	6.453	6.630	6.812	7.000	7
8 *	5.064	5.213	5.368	5.529	5.695	5.868	6.048	6.234	6.428	6.628	6.837	7.053	7.277	7.509	7.750	8.000	8
9 *	5.373	5.549	5.733	5.925	6.126	6.335	6.553	6.781	7.019	7.267	7.526	7.796	8.078	8.372	8.680	9.000	9
10 *	5.641	5.843	6.056	6.279	6.513	6.759	7.017	7.288	7.572	7.871	8.184	8.513	8.858	9.220	9.601	10.000	10
11 *	5.871	6.100	6.340	6.594	6.862	7.145	7.443	7.758	8.090	8.441	8.812	9.203	9.616	10.053	10.513	11.000	11
12 *	6.071	6.323	6.591	6.875	7.176	7.495	7.834	8.194	8.575	8.981	9.411	9.868	10.354	10.870	11.418	12.000	12
13 *	6.243	6.518	6.812	7.125	7.458	7.814	8.193	8.598	9.030	9.491	9.983	10.510	11.072	11.672	12.314	13.000	13
14 *	6.392	6.689	7.007	7.347	7.712	8.103	8.523	8.972	9.455	9.973	10.530	11.127	11.770	12.460	13.202	14.000	14
15 *	6.520	6.838	7.179	7.546	7.941	8.367	8.825	9.320	9.853	10.429	11.051	11.723	12.449	13.233	14.082	15.000	15
16 *	6.631	6.967	7.330	7.723	8.147	8.606	9.103	9.642	10.226	10.860	11.549	12.296	13.109	13.993	14.954	16.000	16
17 *	6.727	7.081	7.464	7.880	8.332	8.824	9.358	9.941	10.576	11.268	12.024	12.849	13.752	14.738	15.818	17.000	17
18 *	6.809	7.179	7.582	8.021	8.499	9.022	9.593	10.218	10.903	11.653	12.477	13.382	14.377	15.470	16.674	18.000	18
19 *	6.881	7.266	7.686	8.146	8.649	9.201	9.808	10.475	11.209	12.018	12.910	13.895	14.985	16.189	17.523	19.000	19
20 *	6.943	7.341	7.778	8.257	8.784	9.365	10.005	10.713	11.496	12.362	13.323	14.390	15.576	16.895	18.363	20.000	20
21 *	6.996	7.407	7.858	8.356	8.906	9.514	10.187	10.934	11.764	12.688	13.718	14.867	16.151	17.588	19.196	21.000	21
22 *	7.042	7.464	7.930	8.445	9.015	9.649	10.353	11.139	12.015	12.996	14.094	15.326	16.711	18.268	20.022	22.000	22
23 *	7.082	7.514	7.993	8.523	9.114	9.772	10.506	11.329	12.251	13.287	14.454	15.769	17.255	18.936	20.840	23.000	23
24 *	7.116	7.558	8.048	8.594	9.202	9.883	10.647	11.505	12.471	13.562	14.797	16.196	17.784	19.591	21.650	24.000	24
25 *	7.146	7.596	8.097	8.656	9.282	9.985	10.776	11.668	12.678	13.822	15.124	16.607	18.299	20.235	22.454	25.000	25
26 *	7.171	7.629	8.140	8.712	9.354	10.077	10.894	11.819	12.871	14.069	15.437	17.003	18.800	20.867	23.250	26.000	26
27 *	7.193	7.658	8.178	8.761	9.419	10.161	11.003	11.960	13.052	14.301	15.735	17.384	19.287	21.488	24.038	27.000	27
28 *	7.212	7.683	8.211	8.806	9.477	10.237	11.102	12.090	13.221	14.521	16.020	17.752	19.761	22.097	24.820	28.000	28
29 *	7.229	7.706	8.241	8.845	9.529	10.307	11.194	12.211	13.380	14.729	16.291	18.107	20.222	22.695	25.594	29.000	29
30 *	7.243	7.725	8.267	8.880	9.576	10.370	11.278	12.323	13.528	14.926	16.551	18.448	20.671	23.283	26.361	30.000	30
35 *	7.290	7.790	8.358	9.006	9.750	10.609	11.606	12.771	14.141	15.759	17.682	19.979	22.736	26.063	30.095	35.000	35
40 *	7.313	7.823	8.406	9.076	9.852	10.757	11.820	13.079	14.582	16.389	18.578	21.250	24.535	28.600	33.661	40.000	40
45 *	7.323	7.840	8.432	9.116	9.913	10.849	11.960	13.290	14.899	16.864	19.288	22.307	26.102	30.914	37.069	45.000	45
50 *	7.329	7.848	8.446	9.138	9.948	10.906	12.051	13.435	15.127	17.223	19.851	23.185	27.466	33.026	40.324	50.000	50

Equation:

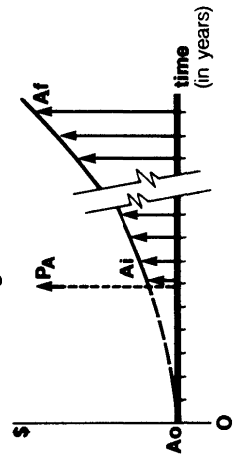
$$\text{Annual Equivalence Factor} = \frac{1 - v^n}{1 - v}, \text{ where } v = \frac{1 + e}{1 + d}$$

e = annual escalation rate

d = discount rate

n = number of years

Cash Flow Diagram:



B-2. Table B-3 provides escalation factors for differential escalation rates from -5 percent through +10 percent, in 1 percent increments, for escalation periods of 1/4, 1/2, 3/4, 1, 2, . . . 30, 35, 40, 45, and 50 years.

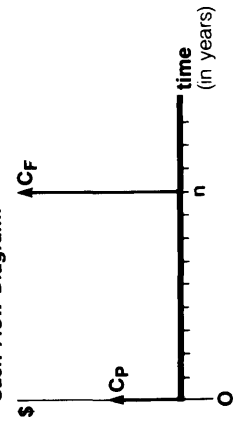
Table B-3 Escalation factors

YEARS TO ESCALATE	-5%	-4%	-3%	-2%	-1%	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	YEARS TO ESCALATE
1	0.950	0.960	0.970	0.980	0.990	1.000	1.010	1.020	1.030	1.040	1.050	1.060	1.070	1.080	1.090	1.100	1
2	0.903	0.922	0.941	0.960	0.980	1.000	1.020	1.040	1.061	1.082	1.102	1.124	1.145	1.166	1.188	1.210	2
3	0.857	0.885	0.913	0.941	0.970	1.000	1.030	1.061	1.093	1.125	1.158	1.191	1.225	1.260	1.295	1.331	3
4	0.815	0.849	0.885	0.922	0.961	1.000	1.041	1.082	1.126	1.170	1.216	1.262	1.311	1.360	1.412	1.464	4
5	0.774	0.815	0.859	0.904	0.951	1.000	1.051	1.104	1.159	1.217	1.276	1.338	1.403	1.469	1.539	1.611	5
6	0.735	0.783	0.833	0.886	0.941	1.000	1.062	1.126	1.194	1.265	1.340	1.419	1.501	1.587	1.677	1.772	6
7	0.698	0.751	0.808	0.868	0.932	1.000	1.072	1.149	1.230	1.316	1.407	1.504	1.606	1.714	1.828	1.949	7
8	0.663	0.721	0.784	0.851	0.923	1.000	1.083	1.172	1.267	1.369	1.477	1.594	1.718	1.851	1.993	2.144	8
9	0.630	0.693	0.760	0.834	0.914	1.000	1.094	1.195	1.305	1.423	1.551	1.689	1.838	1.999	2.172	2.358	9
10	0.599	0.665	0.737	0.817	0.904	1.000	1.105	1.219	1.344	1.480	1.629	1.791	1.967	2.159	2.367	2.594	10
11	0.569	0.638	0.715	0.801	0.895	1.000	1.116	1.243	1.384	1.539	1.710	1.898	2.105	2.332	2.580	2.853	11
12	0.540	0.613	0.694	0.785	0.886	1.000	1.127	1.268	1.426	1.601	1.796	2.012	2.252	2.518	2.813	3.138	12
13	0.513	0.588	0.673	0.769	0.878	1.000	1.138	1.294	1.469	1.665	1.886	2.133	2.410	2.720	3.066	3.452	13
14	0.488	0.565	0.653	0.754	0.869	1.000	1.149	1.319	1.513	1.732	1.980	2.261	2.579	2.937	3.342	3.797	14
15	0.463	0.542	0.633	0.739	0.860	1.000	1.161	1.346	1.558	1.801	2.079	2.397	2.759	3.172	3.642	4.177	15
16	0.440	0.520	0.614	0.724	0.851	1.000	1.173	1.373	1.605	1.873	2.183	2.540	2.952	3.426	3.970	4.595	16
17	0.418	0.500	0.596	0.709	0.843	1.000	1.184	1.400	1.653	1.948	2.292	2.693	3.159	3.700	4.328	5.054	17
18	0.397	0.480	0.578	0.695	0.835	1.000	1.196	1.428	1.702	2.026	2.407	2.854	3.380	3.996	4.717	5.560	18
19	0.377	0.460	0.561	0.681	0.826	1.000	1.208	1.457	1.754	2.107	2.527	3.026	3.617	4.316	5.142	6.116	19
20	0.358	0.442	0.544	0.668	0.818	1.000	1.220	1.486	1.806	2.191	2.653	3.207	3.870	4.661	5.604	6.727	20
21	0.341	0.424	0.527	0.654	0.810	1.000	1.232	1.516	1.860	2.279	2.786	3.400	4.141	5.034	6.109	7.400	21
22	0.324	0.407	0.512	0.641	0.802	1.000	1.245	1.546	1.916	2.370	2.925	3.604	4.430	5.437	6.659	8.140	22
23	0.307	0.391	0.496	0.628	0.794	1.000	1.257	1.577	1.974	2.465	3.072	3.820	4.741	5.871	7.258	8.954	23
24	0.292	0.375	0.481	0.616	0.786	1.000	1.270	1.608	2.033	2.563	3.225	4.049	5.072	6.341	7.911	9.850	24
25	0.277	0.360	0.467	0.603	0.778	1.000	1.282	1.641	2.094	2.666	3.386	4.292	5.427	6.848	8.623	10.835	25
26	0.264	0.346	0.453	0.591	0.770	1.000	1.295	1.673	2.157	2.772	3.556	4.549	5.807	7.396	9.399	11.918	26
27	0.250	0.332	0.439	0.580	0.762	1.000	1.308	1.707	2.221	2.883	3.733	4.822	6.214	7.988	10.245	13.110	27
28	0.238	0.319	0.426	0.568	0.755	1.000	1.321	1.741	2.288	2.999	3.920	5.112	6.649	8.627	11.167	14.421	28
29	0.226	0.306	0.413	0.557	0.747	1.000	1.335	1.776	2.357	3.119	4.116	5.418	7.114	9.317	12.172	15.863	29
30	0.215	0.294	0.401	0.545	0.740	1.000	1.348	1.811	2.427	3.243	4.322	5.743	7.612	10.063	13.268	17.449	30
35	0.166	0.240	0.344	0.493	0.703	1.000	1.417	2.000	2.814	3.946	5.516	7.686	10.677	14.785	20.414	28.102	35
40	0.129	0.195	0.296	0.446	0.669	1.000	1.489	2.208	3.262	4.801	7.040	10.286	14.974	21.725	31.409	45.259	40
45	0.099	0.159	0.254	0.403	0.636	1.000	1.565	2.438	3.782	5.841	8.985	13.765	21.002	31.920	48.327	72.890	45
50	0.077	0.130	0.218	0.364	0.605	1.000	1.645	2.692	4.384	7.107	11.467	18.420	29.457	46.902	74.358	117.391	50
.25	0.987	0.990	0.992	0.995	0.997	1.000	1.002	1.005	1.007	1.010	1.012	1.015	1.017	1.019	1.022	1.024	.25
.50	0.975	0.980	0.985	0.990	0.995	1.000	1.005	1.010	1.015	1.020	1.025	1.030	1.034	1.039	1.044	1.049	.50
.75	0.962	0.970	0.977	0.985	0.992	1.000	1.007	1.015	1.022	1.030	1.037	1.045	1.052	1.059	1.067	1.074	.75

Equation:

Escalation Factor =  $(1 + e)^n$ , where  $e$  = annual escalation rate  
 $n$  = number of years of escalation

Cash Flow Diagram:



B-3. Table B-4 provides discount factors for discount rates of 7 and 10 percent for discounting periods of 1/4, 1/2, . . . 3/4, 1, 2, 30, 40, 45, and 50 years.

Table B-4 Discount factors

YEARS		DISCOUNT RATE 7%		RATE 10%		YEARS	
1	*	0.9346	0.9091	*	1		
2	*	0.8734	0.8264	*	2		
3	*	0.8163	0.7513	*	3		
4	*	0.7629	0.6830	*	4		
5	*	0.7130	0.6209	*	5		
6	*	0.6663	0.5645	*	6		
7	*	0.6227	0.5132	*	7		
8	*	0.5820	0.4665	*	8		
9	*	0.5439	0.4241	*	9		
10	*	0.5083	0.3855	*	10		
11	*	0.4751	0.3505	*	11		
12	*	0.4440	0.3186	*	12		
13	*	0.4150	0.2897	*	13		
14	*	0.3878	0.2633	*	14		
15	*	0.3624	0.2394	*	15		
16	*	0.3387	0.2176	*	16		
17	*	0.3166	0.1978	*	17		
18	*	0.2959	0.1799	*	18		
19	*	0.2765	0.1635	*	19		
20	*	0.2584	0.1486	*	20		
21	*	0.2415	0.1351	*	21		
22	*	0.2257	0.1228	*	22		
23	*	0.2109	0.1117	*	23		
24	*	0.1971	0.1015	*	24		
25	*	0.1842	0.0923	*	25		
26	*	0.1722	0.0839	*	26		
27	*	0.1609	0.0763	*	27		
28	*	0.1504	0.0693	*	28		
29	*	0.1406	0.0630	*	29		
30	*	0.1314	0.0573	*	30		
35	*	0.0937	0.0356	*	35		
40	*	0.0668	0.0221	*	40		
45	*	0.0476	0.0137	*	45		
50	*	0.0339	0.0085	*	50		
.25	*	0.9832	0.9765	*	.25		
.50	*	0.9667	0.9535	*	.50		
.75	*	0.9505	0.9310	*	.75		

Equation:

Discount Factor =  $\frac{1}{(1 + d)^n}$ , where  $d$  = discount rate  
 $n$  = number of years escalation

